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Analysis of ground water and spring water quality in Aljabal Al akhdar

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Abstract: *Water samples were collected from 10 wells and 4 spring during two seasons (Autumn and Winter, 2015) to determine bacteriological, chemical and physical quality for ground water and spring water .Physicochemical parameters of water sample were obtained revealed that most of the results were within required levels by WHO. However, the MPN of coliform and feacal coliform were above recommended levels by WHO for all samples.*
The study showed that all wells and springs were highly contaminated with feacal E. coli. In present study the total coliform varied from 1380 to 1800 per 100 ml, while fecal coliform count varied from 0.4 to 1800 per 100 ml in water samples. The study provides indicators of presence of bacteria that represent a real health hazard in water sources in the Masa city.

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I. Introduction

Pollution caused by the introduction of any material that is familiar to the water [1] ,such as bacteria, fungi and parasites , inorganic contaminants, pesticides and herbicides, organic chemical, ammonia ,nitrate and radioactive [2]. chemicals and radioactive materials are not suitable for drinking may cause significant damage to human and animal[1].

Pollutants such as pesticides and other industrial toxic chemicals waste in environment that was the pollutants which cause the contamination of both surface and underground water[3]. Toxic organic and inorganic compounds, heavy metals, salt pathogenic microorganism may also be present in water which find their way through industrial and agricultural waste. Water should be free of contaminants that according to the world health organization[4]. Moreover the main source of pollution were sewage water and human activities, Agricultural and the effect of organic and inorganic fertilizer[5,6,7]. And industrial sewage[8]. As well as the dissolves minerals and the heavy metal and activity human was the important source of the ground water pollution[9].

The surface and underground water contaminated by liquid and solid wastes and water Infections by poor quality sources[10]. The main throat problem to human safety is microbial contaminated drinking water[11]. Also safe drinking-water has a significant impact in the prevention of water-related diseases in communities[4,12]. About of 320 million people still have no access in Africa to safe water supplies[13].

Coliforms were the major microbial indicators of monitoring water quality[14]. Human health could be in greater risk by the human faecal, because its contains human enteric pathogens[15]. The health risk for consumers may caused by faecal polluted with several microbial pathogens[16]. Fecal coliform bacteria indicate the presence of sewage contamination and the possible presence of other pathogenic organisms. the source water may be contaminated by pathogens or disease[17].

The most important among bacterial indicators are coliforms and *Escherichia coli* used in water quality definition and health risk[18]. The study was leaded of some microbial pollution indicators such as - total count, total coliforms, fecal coliforms, *E. coli* and fecal streptococci from water [19]. The results from microbial analysis was indicated that the high total coliform (TC) counts from 23 to >1,100 MPN/100 ml, with 94 % of the samples being grossly polluted[19]. Shah *et al.*, (2013) found that microbes in water samples giving emphasis to pathogenic species in the water[20].

II. Material And Methods

2.1 Area of study

Green Mountain is the high mountain area covered by forests in northeast Libya, characterized by a rise for most areas of Libya and Atomize its high rainfall rates, in addition to the fertile land suitable for agriculture offer. Masa is small city located in the east of Libya and just 10 km west of El bayda City. Surrounded by farms.

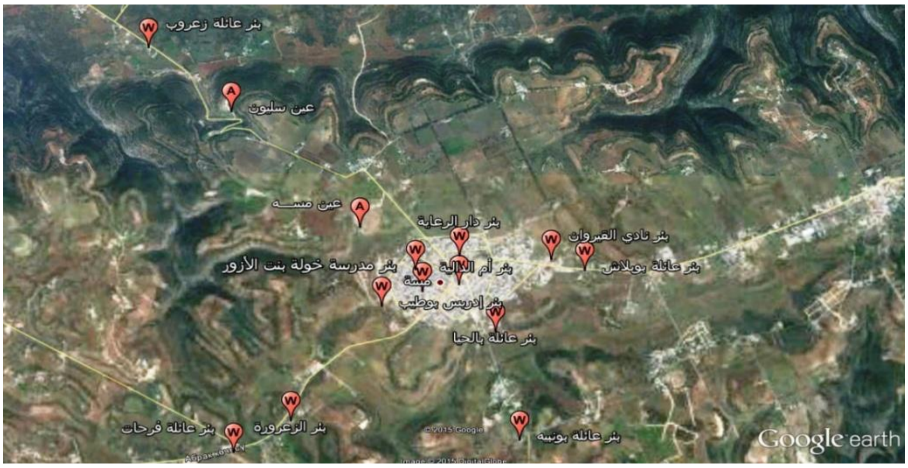


Figure 1: The sites of four spring and ten wells water in Masa.

2.2 Collecting of samples Water sample were collected from 10 wells and 4 spring (three replicate \ sample) from different areas during two season (autumn and winter, 2015).

2.3 Physical and chemical analysis were was determined in the Central Laboratory of Chemistry, Faculty of science University of Omar AL- Mukhtar using standard procedures.

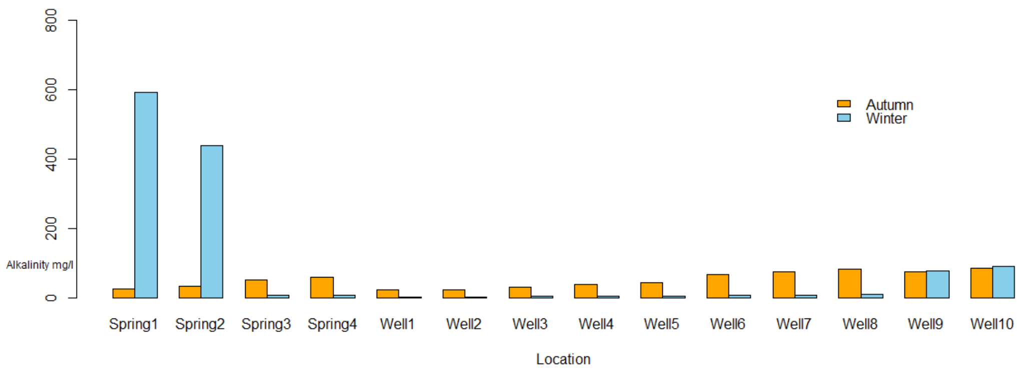
2.4 Most probable number (MPN) MPN counts are statistical best estimates (hence the name, most probable number) obtained by culturing a number (usually five) of sample volumes and/or dilutions of such sample. MPN method which described in standard method. Eaton *et al*., (1995) was used to enumeration of coliform and faecal coliform bacteria after 48h of incubation[21] .

In this study program the R is used for statically computing to analyze statistical data.

III. Result and discussion

3.1 Physical and chemical analysis

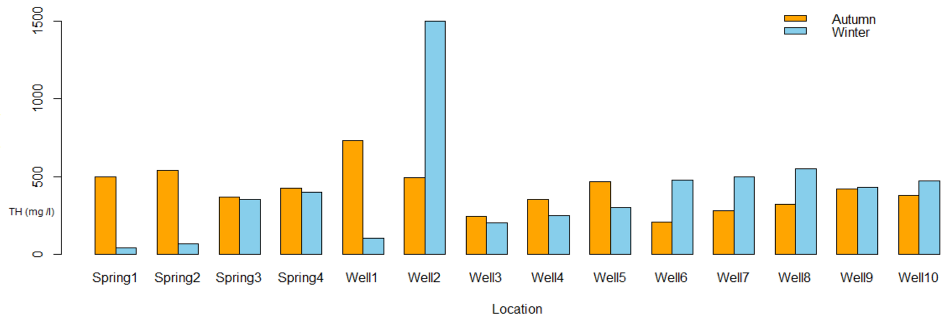
The total alkalinity is the sum of carbonates and bicarbonates, The value of bicarbonates are also used to express alkalinity, in the absence of carbonates[22]. Fig. 2 Shows the effect of location on Alkalinity mg\l at different season for all springs and wells, The results showed that there are not significant effect of location and season on Alkalinity. This result was in agreement with WHO. However, the samples from spring1 was in not agreement with WHO. Maybe the increase in alkaline concentration in spring1 due to the presence of a sewage filter near the site of the spring and an increase in calcium and magnesium carbonates. Ombakao *et al*., (2013) found that the alkalinity ranged from 0.40 to 7.68 mg/l in wet season and from 0.19 to 5.33 mg/l in dry seas[23]. These results indicated that the levels of alkalinity were high in wet season than in dry season.



Figures.2 Determination of Alkalinity mg\l at different season for all springs and wells

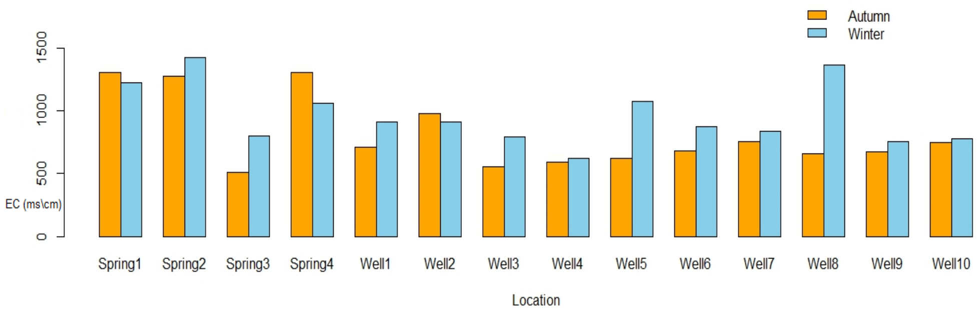
The principal natural sources of hardness in water are dissolved polyvalent metallic ions from sedimentary rocks, seepage and runoff from soils. Calcium and magnesium, the principal ions, are present in many sedimentary rocks, the most common being limestone and chalk [4]. Fig.3 Shows the effect of location on total hardness TH mg\l at different season for all springs and wells.

The total hardness concentration of the samples were ranged from 40 to 1500 mg\l in winter, and the sample from spring 2 (550) and well1 (730) during Autumn and well 2 was (1500) and well8 (550) during winter. This result was not agreement with WHO (500 mg\l). May be were increase total hardness elevation in certain locations of a study due to the increase of calcium and magnesium bicarbonates. These results was not agreement with Ombakao *et al.*, (2013) found that total hardness was ranged from 2.0-23.32 mg/l and from 0.2 – 17 mg/l in the wet and dry season respectively [23]. these results was indicated that the high level concentration winter might be due the solvent action of rain water with soil and rocks which able to dissolving calcium and magnesium.



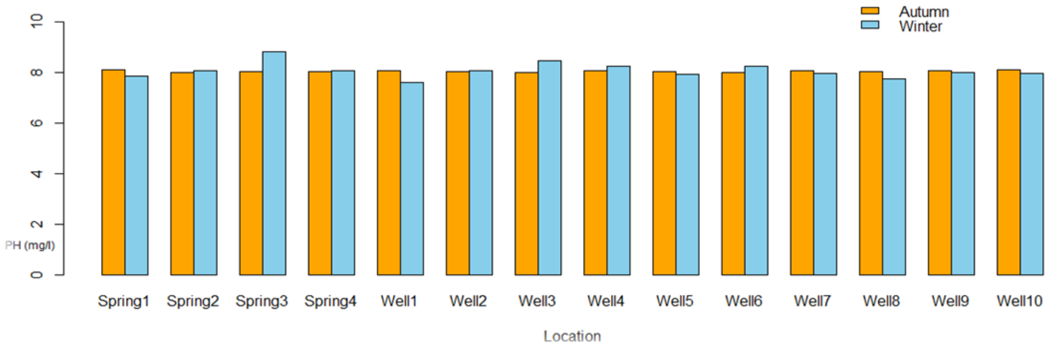
Figures. 3 Determination of TH mg\l at different season for all wells and springs

Figures.4 Shows the effect of location on electrical conductivity EC (μs \cm) at different season for all springs and wells, the EC ranged from 510 to 1370 µs/cm during the autumn. This results was in agreement with WHO standers (1500 µs/cm) and range from 622 to 1426 µs/cm in winter. This results was in agreement with WHO standers.



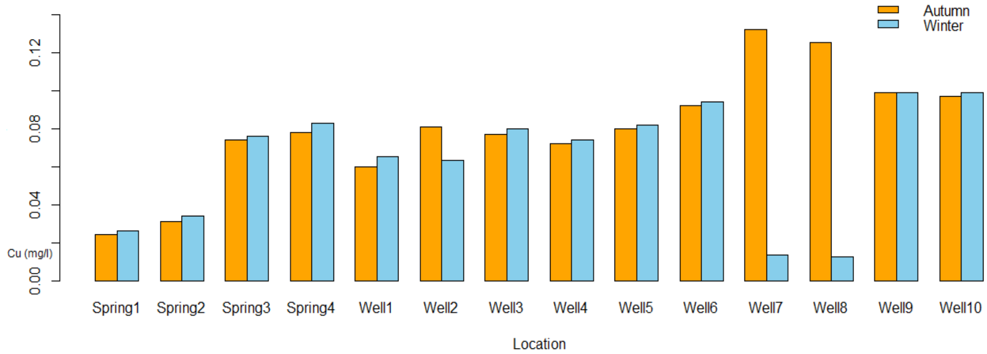
Figures .4 Determination of EC(μs \cm) at different season for all wells and springs.

Figures.5 Shows the effect at location on pH mg\l at different season for all springs and wells, The results showed that there are not significant effect of location and season on pH . The pH of water samples ranged from 8.01to 8.092 mg/l during the autumn. and ranged from 7.60 to 8.46 mg/l in Winter. This result was in agreement with WHO (8.50-6.50 mg/l). The result was difference to with Priyanka *et al.*, (2014)[24].



Figures.5 Determination of pH mg\l at different season for all wells and springs

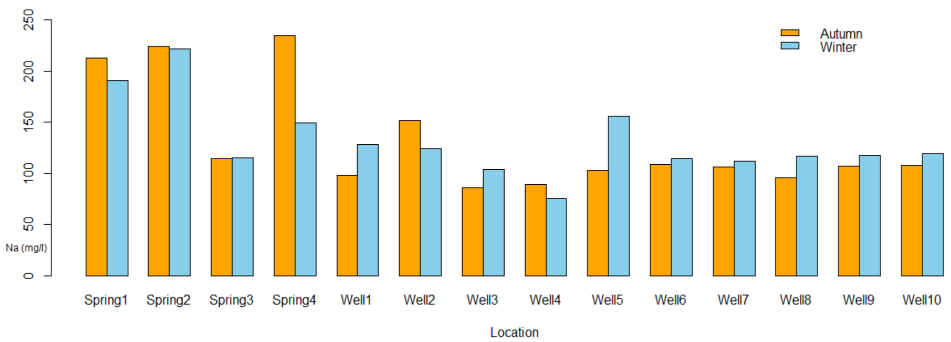
Figures. 6 Shows the effect of location on Cu mg\l at different season for all springs and wells. The results showed that there are not significant effect of location and season on cu. The Cu ranged from 0.024 to 0.099 mg/l during the autumn and was ranged from 0.026 to 0.099 in winter. This result was in agreement with WHO standers (0.01-1.0 mg/l). The copper is an essential element for the growth of aquatic organisms and human Copper is required in many enzymatic reaction[25].



Figures .6 Determination of Cu mg\l of different season for all springs and wells.

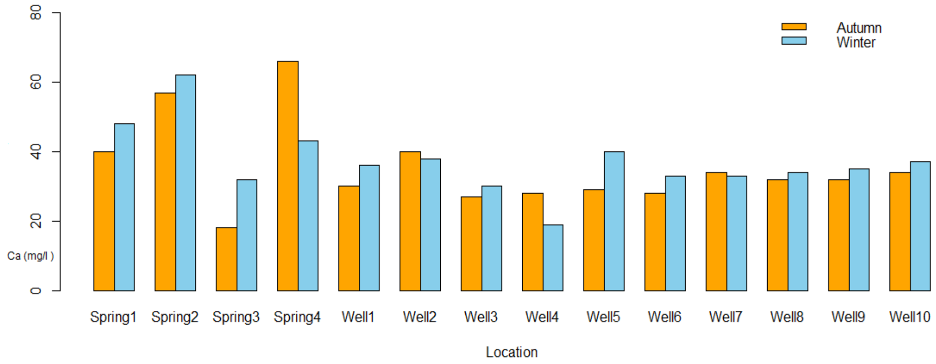
Sodium (Na)

Figures.7 Shows the effect of location on Na mg\l at different season for all springs and wells. The results showed that there are not significant effect of location and season on Na.
The Na ranged from 86 to 235 mg/l during the autumn and range from 75 to 222 mg/l in winter, however the samples spring1 was (213), and spring2 was (224), and spring4was (235) this result was not agreement with WHO standers (<200). May be the increase sodium in water have been due to the geological composition of the soil or the use of agricultural fertilizers. Excessive intake of very high doses of sodium can cause severe effects such as nausea, vomiting and inflammatory reactions in the device Gastrointestinal, thirst, high blood pressure. Central nervous system disorders such as convulsions, confusion and pulmonary embolism[26].



Figures. 7 Determination of Na mg\l at different season for all springs and wells.

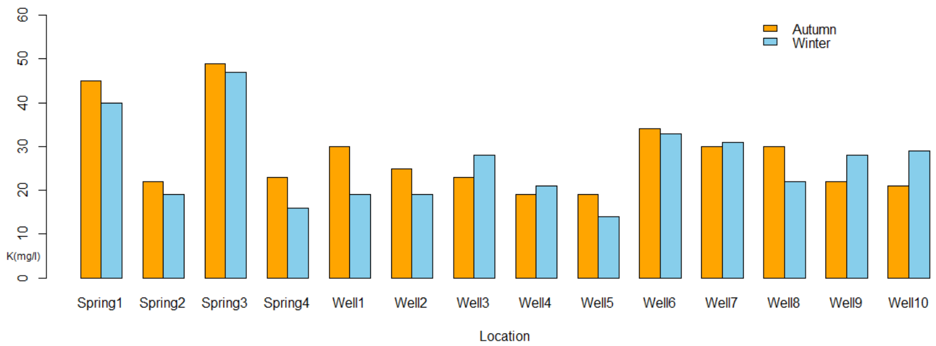
Figures. 8 Shows the effect of location on Ca mg\l at different season for all springs and wells. The results showed that there are not significant effect location and season on Ca . the Ca ranged from 18 to 66 mg/l during the Autumn and range from 19 to 62 mg/l in winter. This result was in agreement with WHO standers (200 mg/l). These results was similar with[27].



Figures. 8 Determination of Ca mg\l at different season for all springs and wells

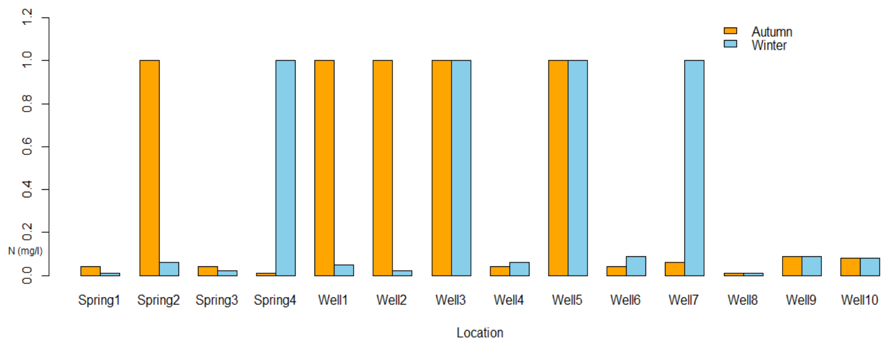
Figures. 9 Shows the effect of location on K mg\l at different season for all springs and wells. The results indicated that there are high significant effect of season the p-value was (9.825e-05) and there are not significant effect of location on K.

The K ranged from `19 to 49 mg/l during the autumn and range from 19 to 47 mg/l in winter, However the samples from spring1(45) and spring3(49) in autumn, and spring3 (47) in winter. This result was not agreement with WHO standers(40mg/l). May be the increases potassium in water due to the geological composition of the soil, or the use of agricultural fertilizers.



Figures. 9 Determination of K mg\l at different season for all springs and wells.

Figures.10 Shows the effect of location on N mg\l at different season for all springs and wells . The results showed that there are not significant effect of location and season on N. The N ranged from 0.01 to 0.011 mg/l during the Autumn and range from 0.01 to 0.011 mg/l in winter. This result was in agreement with WHO standers(<50 mg/l).



Figures .10 Determination of N mg\l at different season for all springs and wells.

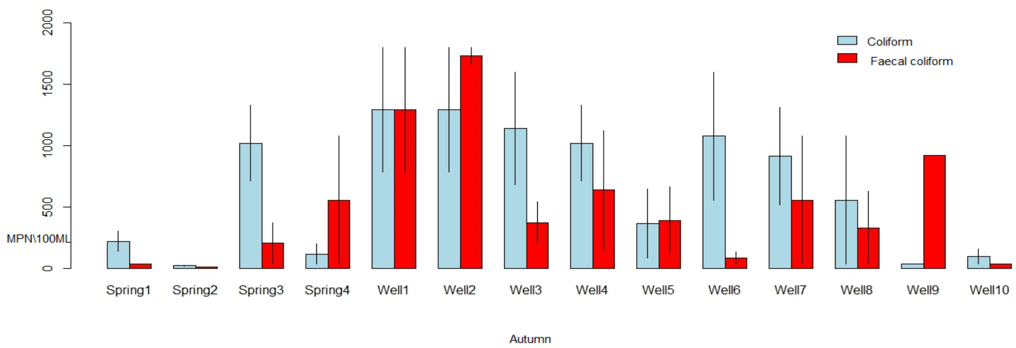
3.2 Enumeration of bacteria

Figures.11 showed that The effect of Autumn and winter seasons on (MPN/100ml) of coliform and faecal coliform after 48h of incubation at 37C° in all wells and springs. The results showed that the maximum total of coliform in all wells and springs at different location was 1800 MPN during Autumn season and the minimum total of coliform was 9.0 MPN. and there are high significant effect of autumn in the bacteria the p value was (0.0005633***). also there are high significant effect of autumn on (MPN/100 ml) of coliform and feacal coliform in well1,well2 and well4 after 48h. the p- value for well1 well2 and well4 was (0.000838***, 9.3e-05***,0.039084) respectively.

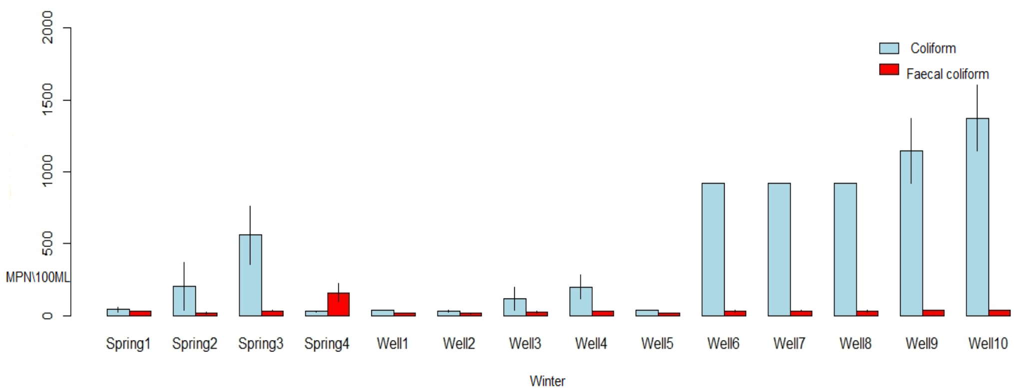
Figures.12 shows that there are significant effect of winter on MPN of coliform and feacal coliform in well 6 ,well 7, well 8, well 9 and well 1 after 48h. the p- value for well 6 ,well 7, well 8 ,well 9 and well10 (0.011975*, 0.011487*,0.011975*,0.001690**, 0.000194***) respectively.

The effect of winter season on (MPN/100ml) of coliform and faecal coliform after 48h in wells and springs. The results showed that the maximum total of coliform in all wells and springs at different location was 1600 MPN during Autumn season and the minimum total of coliform was 4.0 MPN. and there are high significant effect of winter in the bacteria the p value was (5.014e-05***). Hammuel *et al.*, (2014) reported that the result of the MPN has revealed that all the well water were highly contaminated with coliforms[28]. Balogun *et al.*, (2013) Found the most probable number (MPN) of coliforms per 100 ml of water sample. In the highest MPN/100ml value for coliform was recorded at lsunpaiye while the lowest value was in Agadaidi spring[29]. Ombakao *et al.*, (2013) founded that mean MPN of coliform organisms /100ml were 2420 during wet season while during dry season it ranged from 816 to >2420. A highly significant variation was observed in *E. coli* between wet and dry season [23].

The total coliforms were detected in all samples of Nile water with the highest count of bacteria being 4.8 MPN /100 ml in Giza areas[30]. microbial indicators were used for Coliform bacterial estimation of water [31]. The present of high MPN values may be signal of the presence of high organic compounds and animal and human wastes in the water [32,33].



Figures.11 Effect of Autumn season on (MPN\100ml of coliform and feacal coliform) after 48h in wells and springs .



Figures. 12 Effect of Winter season on (MPN\100ml of coliform and feacal coliform) after 48 h in wells and spring.

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